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INFORMATION REPORT

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COUNTRY Yugoslavia

SUBJECT Austenitic Stainless Steel Welding

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1. For the past year the laboratories at Zenica and Jesenice have been working on the problems involved in manufacturing equipment for the chemical industry and in repairing turbine assemblies in the Drava and Isonzo power stations.
2. In the course of these experiments, the stainless steel produced at Jesenice known as Prokron has proved of great value. This steel is produced in two varieties: "Prokron 11" (Cr - Ni 18/8), and "Prokron 19", a high temperature resisting alloy based on a high percentage of Ni and Cr. Prokron 19 has already been adopted as the standard alloy for the manufacture of fine winding wire.
3. In repairing the Kaplan No. 3 turbine at Dravograd, Prokron 11 steel was used. This steel may be welded either by oxy-acetylene or electric arc welders. Because of the lack of nationally produced electrodes, "Boehler Fox Sas 4" electrodes were employed. The Testing Commission confirmed the success of the repairs effected, and recommended that the Ministry of Electric Power approve the repair of all the other turbines in this manner.
4. Engineer Leo Kzez undertook the task of producing an austenitic steel electrode capable of being manufactured in Yugoslavia. This electrode consists of a Prokron 19 austenitic steel rod, flux coated, for metallurgical reasons, with such nationally produced substances as fluoride, chalk, and ferromanganese, instead of acid. As a result of a special technique permitting the most rapid examination of weld slag, it was found possible to produce a flux giving a stronger and more ductile weld.
5. This new nationally produced austenitic electrode, otherwise known as Prokron Electrode, is now in production at Jesenice. It has been laboratory tested and serves national needs. This electrode will be used, together with Boehler Fox Sas 4 and Swedish electrodes, in repairing the Kaplan No. 2 turbine at Dravograd.
6. The characteristics of the electrode used to weld Prokron steel are:
 - a. Prokron 19 rod composed of:

C 0.15 - 0.25 percent

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Mn	Approximately 0.5 percent
Si	Approximately 0.5 percent
Cr	24 - 26 percent
Ni	20 - 21 percent

b. Flux coating containing experimentally determined quantities of fluoride, chalk, ferromanganese, and water glass.

7. The new electrode, in common with Prokron steel, has, however, one defect: it is susceptible to intercrystalline corrosion. In order to overcome this, stainless steel intended for welding must include molybdenum, as well as titanium (in proportion of 5 x carbon content), or Ni Cb (in proportion of 10 x carbon content), or tantalum. With the addition of these alloys, Prokron steel will be able to remain stable under welding. Further, the addition of these alloys does not affect the technique of welding or fluxing since their stabilizing effect operates after and not during welding.
8. With a view to solving the problem outlined above, the following proposal was made: modern welding technique requires a stainless steel proof against intercrystalline corrosion and the effects of slow cooling after welding. With these advantages, the composition of Prokron 11 should consist of:

C	bare minimum, max.	0.10 percent
Si	Approximately	0.5 percent
Mn	0.5 - 1.0	percent
Cr	17 - 18	percent
Ni	8 - 3	percent
Mo	2 - 3	percent
Nb plus Ta		1 percent
Ti	1 - 1.5	percent
S	plus P bare minimum	

These special additions are also proposed for Prokron 19, with the difference that the carbon content is less.

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